Gamow-Teller giant resonance in ^{132}Sn

M. Sasano[2], J. Yasuda[1,2], R. G. T. Zegers[3,4,5], H. Baba[2], D. Bazin[3], W. Chao[2], M. Dozono[2], N. Fukuda[2], N. Inabe[2], T. Isobe[2], G. Jhang[2,3], D. Kameda[2], M. Kaneko[6,2], K. Kisamori[2,7], M. Kobayashi[7], N. Kobayashi[8], T. Kobayashi[2,9], S. Koyama[2,8], Y. Kondo[10,2], A. J. Krasznahorkay[11], T. Kubo[2], Y. Kubota[2,7], M. Kurata-Nishimura[2], C. S. Lee[2,7], J. W. Lee[12], Y. Matsuda[13], E. Milman[2,14], S. Michimasa[7], T. Motobayashi[2], D. Muecher[2,15,16], T. Murakami[6], T. Nakamura[10,2], N. Nakatsuka[2,6], S. Ota[7], H. Otsu[2], V. Panin[2], W. Powell[2], S. Reichert[2,15], S. Sakaguchi[1,2], H. Sakai[2], M. Sako[2], H. Sato[2], Y. Shimizu[2], M. Shikata[10,2], S. Shimoura[7], L. Stuhl[2], T. Sumikama[9,2], H. Suzuki[2], S. Tangwancharoen[2], M. Takaki[7], H. Takeda[2], T. Tako[9], Y. Togano[10,2,17], H. Tokieda[7], J. Tsubota[10,2], T. Uesaka[2], T. Wakasa[1], K. Yako[7], K. Yoneda[2] and J. Zenihiro[2]

[1]Department of Physics, Kyushu University, Nishi, Fukuoka 819-0395, Japan
[2]RIKEN Nishina Center, Hirosawa 2-1, Wako, Saitama 351-0198, Japan
[3]National Superconducting Cyclotron Laboratory, Michigan State University, East Lansing, Michigan 48824, USA
[4]Joint Institute for Nuclear Astrophysics, Michigan State University, East Lansing, Michigan 48824, USA
[5]Department of Physics and Astronomy, Michigan State University, East Lansing, Michigan 48824, USA
[6]Department of Physics, Kyoto University, Kyoto 606-8502, Japan
[7]Center for Nuclear Study, University of Tokyo, Bunkyo, Tokyo 113-0033, Japan
[8]Department of Physics, University of Tokyo, Tokyo 113-0033, Japan
[9]Department of Physics, Tohoku University, Miyagi 980-8578, Japan
[10]Department of Physics, Tokyo Institute of Technology, 2-12-1 O-Okayama, Meguro, Tokyo 152-8551, Japan
[11]ATOMKI, Institute for Nuclear Research, Hungarian Academy of Sciences, P. O. Box 51, H-4001 Debrecen, Hungary
[12]Department of Physics, Korea University, Seoul 02841, Republic of Korea
[13]Department of Physics, Faculty of Science and Engineering, Konan University, 8-9-1 Higashinada, Kobe,Hyogo 658-8501, Japan
[14]Department of Physics, Kyungpook National University, Daegu 702-701, Korea
[15]Technical University of Munich, D-85748 Garching, Germany
[16]Department of Physics, University of Guelph, Ontario N1G 2W1, Canada
[17]Department of Physics, Rikkyo University, Tokyo 171-8501, Japan

Gamow-Teller (GT) transition is one of the basic excitation modes in nuclei and occurs as simultaneous flips of spin and isospin of a nucleon inside a nucleus without changing the spatial wave function of the nucleon, i.e. rotation in spin-isospin channel. In nuclei with a large neutron excess, this transition has a strong collectivity appearing as so-called GT giant resonance (GTGR). The GTGR resonance energy of a nucleus is highly sensitive to a short-range repulsive residual interaction that gives positive energies to the rotation of the nucleus in the spin-isospin channel. In short, the GTGR gives knowledge on how rigid a nuclear matter is in the spin-isospin channel. This unique aspect of the GTGR allows one to obtain an empirical constraint on astrophysical scenarios of neutron stars where pion condensation, a phase transition of nuclear matter in the spin-isospin channel, may occur. In this talk, we present the results of the measurement of the GTGR in ^{132}Sn performed in RIKEN RIBF using the SAMURAI spectrometer. A new experimental technique was employed to measure the (p,n) reaction at intermediate energies with an RI beam in inverse kinematics. A thick target was used to obtain a high luminosity even for RI beams. Through the missing mass spectroscopy, we extracted the GT transition strengths up to a high excitation energy including the GTGR. The so-called Landau Migdal parameter g', which characterizes the strength of the short-range interaction and the critical density of the onset of the pion condensation in nuclear matter, was deduced from the measured GTGR energy in a similar quality as done in stable nuclei, for the first time for a nucleus far from the beta stability line..